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ABSTRACT

Northwestern University's Learning Disabilities Program conducted a study to explore and develop ways of applying computer technology to the fields of reading and learning disabilities and to train specialists who are familiar with computer methods. This study was designed to simulate the actual conditions of the Diagnostic Clinic at Northwestern University. The simulated and computerized child attended the clinic for the same length of time that children actually do attend the diagnostic clinic session; they were subject to similar tests, reports, and observations. The clinic staff met to plan, to develop hypotheses, to make decisions, to develop a diagnosis, and to recommend teaching procedures. At the prestaffing, the team received preliminary information about the child. At the simulated noon staffing, the teams received computer printouts of the morning decisions and planned for two hours of additional diagnostic examinations. At the poststaffing, the teams evaluated the information they had obtained during the simulated sessions and developed a series of diagnostic decisions. The results of this pilot study suggest that computer simulation is a promising technique for the training of specialists in the diagnostic-teaching process. (Author/WR)

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COMPUTER SIMULATION:

A METHOD FOR TRAINING EDUCATIONAL DIAGNOSTICIANS

Research Reports, Wednesday, April 21, 1971. 4:00 to 5:00 P.M.

Simulation has been described as a procedure in which a model or an analog to a real life situation is created for the purpose of testing or teaching. A systems analyst seeks to construct a model or definition of a system that is realistic and corresponds to reality in certain relevant particulars. Thus a simulation duplicates certain activities of a system without attaining reality itself.

Simulation procedures have been increasingly recognized as an effective technique in education. In fact, a recent report to Congress, the Commission on Instructional Technology (March, 1970), forecasted that simulation is likely to become the most important new educational development of the decade.

However, the use of computer simulation as a technique in education has been scarcely explored. Simulated games have been widely used in the fields of business management and military science to promote more efficient decision-making, to better understand the system under study, to analyze the relationship of the elements within the system, and to test certain decision-making rules. Computer simulations permit practice in business management decisions without the risk of bankruptcy; they allow military decision-making to be practiced without the loss of life or actual battles; and they permit prospective medical specialists to make diagnostic and treatment

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decisions without endangering the health of patients. The success found with this technique in many disciplines suggests that the technology could be adapted to the field of reading.

The field of reading, however, has been scarcely touched by the powerful and adaptable technology of the computer. There have been few applications of the computer to the field of reading other than the use of statistical library programs to analyze data in research studies. Most students preparing to be reading specialists and researchers have not been exposed to computer technology. The potential of computer simulation procedures, as well as other computer applications to the field of reading, have been virtually unexplored.

The Computer Feasibility Study.

Northwestern University's Learning Disabilities Program conducted a feasibility study to explore and develop ways of applying computer technology to the fields of reading and learning disabilities and to train specialists who are familiar with computer methods. A major facet of this investigation concerned the development of computer simulation programs as a method of training specialists in the process of diagnosing cases of reading and learning disabilities.

This simulation was designed to simulate the actual conditions of the Diagnostic Clinic at Northwestern University. The simulated and computerized child attended the clinic for the same length of time that children actually do attend the diagnostic clinic session; they were subject to similar tests, reports, and observations. The clinic staff actually met to plan, to develop hypotheses, to make decisions, to develop a diagnosis, and to recommend teaching procedures. This type of simulation has been referred to as an operational simulation, "a simulation within operational environments, in which human participants use their judgments and other human abilities to interact with the simulated system" (Hare, 1967, p. 366).

A primary aim of the reading and learning disabilities programs in colleges and universities is to train prospective specialists to make a diagnosis of a child with a suspected reading disability and to plan and implement remediation within a clinical teaching program. The process of diagnosing and teaching is an ongoing dynamic process requiring the intercorrelation of many elements and variables, including tests, observations, medical reports, and case histories. The selection of data, the functions to be tested, follow-up procedures, hypothesis formulation concerning the nature of the problem, recommendations and referrals, and the development of a teaching plan are among the decisions that must be made.

Typically the diagnostic and teaching process is discussed in a theory course; and the student gains experience while working with children in a clinic or practicum course. Students generally find such clinic experiences extremely valuable. Unfortunately, this clinic practice is often limited within the training program because of the costs involved. For the following reasons clinical experiences are frequently insufficient to adequately train the reading specialists: clinic space is often limited, college supervisory personnel are in short supply, student time that can be devoted to clinic work is insufficient, and mistakes made in diagnosing and teaching may be detrimental for the child involved. Computer simulation can provide one way to supplement and enrich training experiences for the reading disabilities specialist. Simulation is, thus one way to bridge the gap between the theory course and the clinic experiences. It is not intended to be a substitute for either, but it does provide additional experiences without the expense and difficulties involved in the clinical setting.

The Simulated Diagnostic Computer Game.

The simulation procedure was used as an integral part of a graduate course in Diagnosis. This project used a computer simulation game approach to enable the participants (students in the course) to practice diagnostic decision-making. Extensive

information on a specific child with reading disabilities was stored in computer memory. Students were organized into several diagnostic teams, each consisting of about five staff members. Each team made a series of decisions concerning the simulated case. Diagnostic decision-making requires specialists to arrive at decisions concerning the case history, observations, and tests. Realistically, certain constraints limit data collection within any organizational setting, and these constraints affect decisions. Constraints include variables such as time, money, and facilities. Some of these constraints were built into the simulation program.

For example, the scarce resource was time; each request or decision came at a cost of time. If Silent Reading Test A was requested by the staff, the computer checked to find how long this particular test took to administer and if sufficient time remained in the diagnostic session to give it. If not, the computer message in the printout would tell the team that not enough time remained to give that test and that the child had gone to lunch. The computer would also check to find if another test that had been requested by the team could be given in the remaining time.

The teams participating in the computer simulation met for several staffing sessions to make decisions and request information from the computer. A computer printout based on their decisions was given to each member of the team at the next simulated staffing session. The routine of staffing sessions and computer printouts is diagrammed in the flow-chart shown in figure 1. There were four staffing sessions: (1) a pre-staffing; (2) a noon-staffing; (3) a post-staffing; and (4) a concluding session.

At the pre-staffing, the team received preliminary information about the child: name, age, grade, and general problem. The teams were also given the information that could be obtained about the child from the computer. This included scores from a large variety of tests. Total scores or subtest scores could be obtained. In

Flowchart of the Simulated Diagnosis

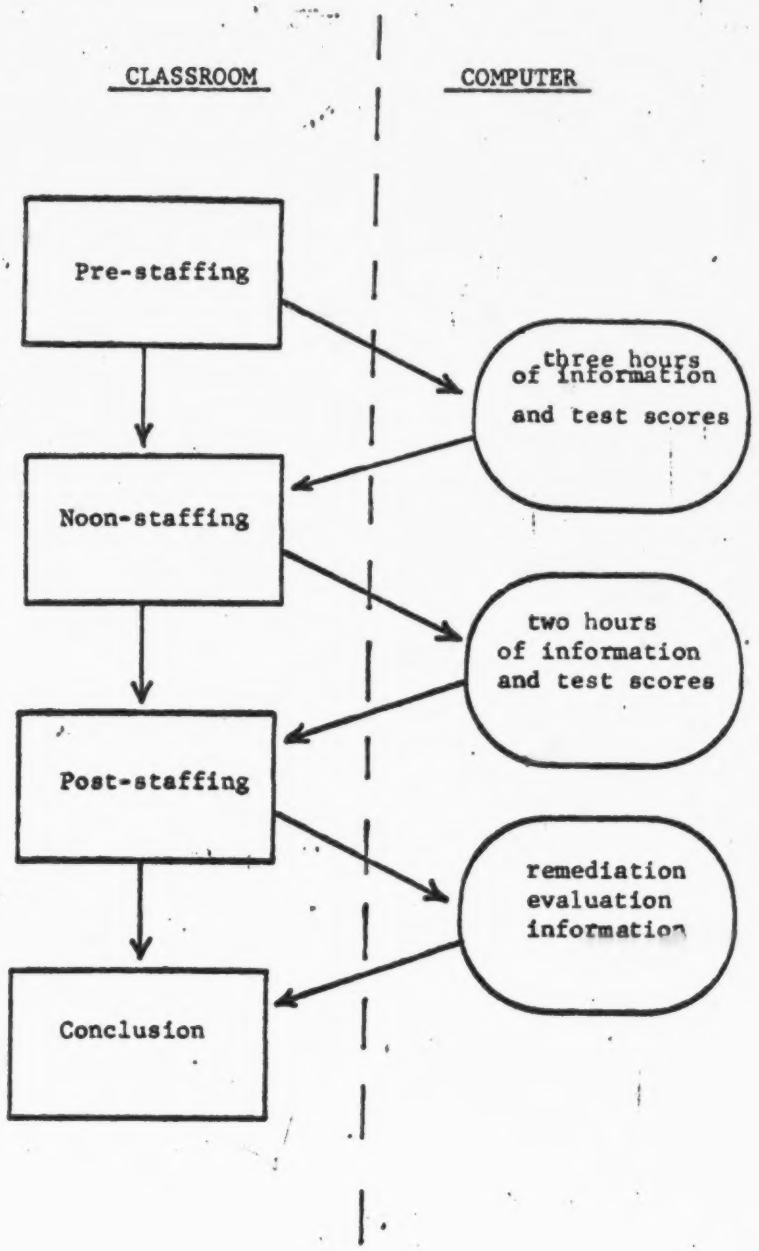

Figure 1

addition, medical reports, neurological reports, EEG reports, ophthalmological, or psychiatric reports could be requested. Other possible information included teacher behavior reports, case history data, speech and language reports, etc. Each piece of information, however, was tied to a realistic time constraint. Since the morning diagnostic session was scheduled for the simulated time period of 9:00 A.M. to 12:00 Noon, the computer would release only three hours of diagnostic information to a team. The pre-staffing, thus, consisted of planning that morning diagnostic session wisely. Though each team was diagnosing the same simulated child, each team received different information because each team had made different diagnostic decisions.

At the simulated noon staffing, the teams received computer printouts of the morning decisions and planned for two hours of additional diagnostic examinations (1:00 P.M. to 3:00 P.M.). At this session, the teams were beginning to develop hypotheses concerning the child's problem and the afternoon session was planned to test or substantiate that hypothesis.

At the post-staffing the teams evaluated the information they had obtained during the simulated sessions and developed a series of diagnostic decisions. These included decisions such as determining whether the child has a disability, his level of development, his areas of strengths and weaknesses, further referrals, and recommended teaching procedures. In addition, specific decisions concerning materials and methods were made. At the concluding staffing each member received a printout showing the decisions made by all the teams participating. At this session a discussion involving the entire class was held of the diagnostic decisions of the various teams.

Student reaction to this simulation project has been enthusiastic. The students commented that the simulation: (1) required them to make decisions concerning tests, information from other professionals and time allotments; (2) created a realistic

face-to-face staffing situation; (3) forced them to organize the data to develop hypotheses; and (4) permitted them to compare their decisions to decisions made by other diagnostic teams.

Implications

The results of this pilot study suggest that computer simulation is a promising technique for the training of specialists in the diagnostic-teaching process. This simulation was only one area of computer application in a project designed to introduce computer technology to prospective reading and learning disabilities specialists. In addition students learned the computer language FORTRAN, wrote and ran programs on the CDC 6400 computer at Northwestern University's Vogelback Computer Center, and developed computer applications to the problems they faced in working with children with reading and learning disabilities. Since specialists are more and more likely to find themselves in career positions in hospitals, schools, and clinics that will have unused computer capacity available, such skills should prove to be very valuable.

A number of procedures are being studied at present to improve and enrich the computer simulation. Students need exposure to various types of disability cases, and a bank of various types of cases could be collected and stored on computer tape. If the program is put on an "on-line computer terminal" facility, it would be possible for the student to give one test at a time and receive immediate feedback to help him make his next decision. It might be possible to provide additional realism in the simulation by providing videotape of the child during the testing and recordings of his performance.

It has been said that the fastest diagnostic method is a shrewd guess. The question arises as to how the investigator comes to make this shrewd guess. Does he pull it out of thin air? Is there a guide? Are there any procedures that will improve his ability to make a good guess?

The initiate needs logical and methodological aids to help him develop such skills. The goal of the simulated diagnosis is to enhance the diagnostic skills of the investigator, to sensitize him to critical symptoms, to give practice in the skill of closure while coping with many variables, and to give experience in team staffing and group decision-making.

References

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